A Building Panel

Field

This invention relates to modular building panels used in the construction of buildings, and in particular but not exclusively , for use in the construction of an inner load bearing wall of a house.

Background of the Invention

The present invention relates to building construction and in particular to the construction of dwellings formed from spaced apart inner and outer walls in which the inner wall provides a load bearing structure which support the upper floors and roof structure etc., and the outer wall is formed of a weather resistant material e.g brickwork, timber cladding etc. A known construction of building is the Canadian timber frame house.

One known inner wall module is pre-assembled from a laminate of plywood, foam and plasterboard. Another known construction comprises two layers of cement fibreboard having a foam layer therebetween.

The present invention seeks to provide a load bearing wall panel which is supplied in modular form and which is dimensionally stable, and is light to handle,

Statements of Invention

According to the present invention there is provided a building panel comprising a rectangular frame having one face covered in a water resistant board, and the other face also covered in a board material, the frame having top and bottom rails being formed from a water resistant composite, with the two rails being joined together by a plurality of spaced apart wood composite "I" beams extending therebetween with two of said I beams forming the sides of the frame, and the space between the faces being filled with insulation.

The term "board" includes various boards derived from timber including hardboard, cardboard, plywood, plaster board etc. Preferably, the said one face in use faces externally of the building and is covered OSB (oriented strand board) or plywood. Said other face in use faces internally of the building and may comprise plywood, plasterboard, calcium board or oxidised magnesium board, or other suitable board preferably having a finished decorative surface e.g a melamine layer laminated on its internal surface, or a laminated plastic layer suitable for decoration.

Such a panel after erection of the inner wall of a building e.g. a house, is substantially weather proof.

The I beams each have upper and lower flanges formed from plywood and a web comprising a rigid foam layer sandwiched between two layers of board, preferably plywood, hardboard or cardboard.

Preferably, intermediate support columns are located one between each pair of adjacent beams, each column comprising a rigid foam centre having a layer of board on each side. In a preferred arrangement, a hollow conduit extends along the middle of the column for its full length and aligns with apertures formed in either or both the top and bottom rails. The conduit is preferably rectangular and is lined on all sides by board or plywood. In use the conduits are used accommodate wiring cable, aerial coaxial cable, pipes, plumbing etc..

The top and bottom rails preferably a "H" or "U" section providing a flat base with arms extending normally thereof with a recess therebetween. If two "u" section rails are used the top rail has its flat base presented outwardly of the panel and the bottom rail has the recess presented outwardly of the panel.

The recessed sides of said two I beams have shouldered dowels longitudinally spaced therein, the dowels in use for fixing a linking post to a panel.

The invention also provides a post for linking together two of the above panels, wherein the post has a rectangular cross-section with a plurality of keyhole apertures spaced along its length and aligning with said dowels, and an alignment means attached to the upper portion of the post for alignment of said apertures and dowels, the alignment means being removable when the post is driven into its operative position.

When constructing an internal wall for a building, in particular a load bearing wall, adjacent wall panels are linked together by linking posts having side portions which are engagable within the recessed sides of the I beams. Where a panel is fixed to an existing wall, a "U" shaped cross-sectional bracket having a similar form to a recessed side of an I beam may be secured to the existing wall and the post may be engagable between said bracket and a recessed side of an I beam in the adjacent panel. The posts may be formed with longitudinal tongues which are a slide fit within the recessed sides of the I beams between the flanges on the respective I-beams.

Preferably the posts comprise a box section having plywood sidewalls and a filled central cavity. The posts may be fixed to the panels by means of shouldered dowels secured to the I-beams engaging in aligned key-hole apertures in clips secured on the posts, preferably within the posts. The clip is made of a resilient material and is inclined internally of the post so that when a dowel is engaged in a key-hole longitudinal displacement of the post will tend to pull the post and respective panel together. Each post may be formed with a lug or other mark on its upper end to both align and orientate the key-hole clips on the post with respect to the dowels on a panel.

Also according to the invention there is provided a method of constructing an internal wall of a building in which panels according to the present invention are fixed to sole plates attached to the floor or base of a building by engaging the recessed bottom rail of each panel over the sole plate and passing fasteners through the arms of the bottom rail and sole plate. The wall panels are then secured together using posts are described above.

Description of the Drawings

The invention will be described by way of example and with reference to the following drawings in which:

Fig.1 is a cross section of a wall panel according to the present invention,

Fig. 2 is an isometric view of a fragment of a wall panel of Fig.1,

Figs. 3-5 are enlarged sections of components shown in Fig.1

Fig. 6 is an isometric view of a support column used in the wall panel

Fig. 7 is an isometric view of the frame of the wall panel with support columns omitted for reasons of clarity,

Fig. 8 is a section through a jointing post for linking together adjacent panels,

Fig. 9 shows an assembled post and panel

Fig. 10 shows a view of one side of the post,

Fig. 11 is an isometric view of an assembly clip as is used within a jointing post,

Fig. 12 is a dowel as is used with the clip,

Fig. 13 shows the method of attaching a wall panel to a floor or base,

Fig.14 shows an alternative jointing post,

Fig.15 shows another jointing post, and

Fig.16 shows an alternative top rail 12.

Detailed Description of the Invention

With reference to Figs. 1 to 7, there is shown a panel 10 which in this example is a module for building the internal load bearing wall of a dwelling or other building. The panel 10 has predetermined standard dimensions for matching with and assembly to other modular panels, for example width W of 1200mm, thickness T of 150mm, and height H of 2400mm. Other panels according the present invention may have difference to at least some of the above dimensions.

Such a panel may also be used for other partition walls, for forming roofing, ceiling panels or floor panels.

Each panel 10 has a rectangular frame 11, see Fig.7 in particular, having top and bottom rails 12,13 interconnected by a plurality of I Beams 14 which form the sides and vertical struts of the frame 11 and are spaced at predetermined distances apart across the width of the panel. A preferred spacing between I beams 14 is 400mm. Support columns 15 also extend between the top and bottom rails 12 ,13 and are located centrally between adjacent pairs of I beams 14. The frame 11 is covered on one face, which is use faces externally of the building, with water resistant board 16 and its other face which in use faces inwardly of the building

with a second board 17. The externally facing board 16 is preferably 10-12mm plywood or OSB and the internally facing board may comprise plywood, plasterboard, hardboard , calcium board, magnesia board etc. which may be laminated with a plastic material layer on its exposed face. The laminated layer may be of any suitable plastics material, for example melamine, a PVA coating, etc. and may be provided with a finished decorative surface or may be suitable for painting or wall papering. The boards 16 & 17 are bonded to the beams 14, and the support columns 15, and the internal space between the boards 16 & 17 is filled with thermal insulation 18.

Referring now particularly to Fig. 3, each I beam is a composite beam having 6-12mm plywood flanges 21,22 with a central web 23 comprising a rigid cellular layer 24 sandwiched between two thin layer 25 of plywood, hardboard, or card board. The flanges 21,22 are about 50mm in width having a central groove 26 on their inside surface to accommodate a web 23 of about 10-12 mm in thickness. The recessed longitudinally extending sides of the two I beams 14A,14B forming the sides of the frame 11 have dowels 27 extending outwardly thereof, and provide a recess 28 used for assembly of adjacent panels.

With particular reference now to Figs. 4 and 6, there is shown a support column 15 which comprises a "H" section skeleton 31 having planar elongate sides 32 interconnected by a pair of spaced apart elongate cross-members 33 located about the transverse centre of the side members. The sides 32 and cross-members 33 may be formed from 2mm plywood or other suitable material and form an enclosed cavity 34 in the middle of the column which provides a conduit extending for the length of the column. In use the conduit may accommodate electrical cable, aerial coaxial cable, pipes etc.. The outwardly facing cavities in the skeleton 11 are filled with a suitable rigid cellular material, for example a closed-cell foam 35.

With reference now particularly to Fig. 5, the top and bottom rails are substantially identical in cross-section and in this example each comprises a "U" shaped section channel formed from water resistant wood composite, preferably 12mm plywood. The rails have a flat base 41 with arms 42 extending normally of the base on each side thereof to form an open sided recess 43 between the two arms. Apertures 44 are located in the base 41 for alignment with the conduits 34 formed in the columns 15. The top rail 12 has its base 41 uppermost facing outwardly of the frame 11 to provide an upper

surface for the panel 10 and the recess 43 faces inwardly to receive stepped end portions of the I-beams 14 and columns 15. The bottom rail 13 also has its base 41 uppermost with the recess 43 facing downwards and outwardly of the frame 11.

The insulating material 18 may comprise one of Rockwool, dried pulp paper treated with fire-retardant, and fire-retardant foam.

With reference now to Figs 8-11, adjacent panels are linked together using a jointing post 81 in this example for joining two panels normally of each other to form a corner. The jointing post is box section comprising sidewalls 82-85 formed from plywood with the centre filled with rigid cellular material e.g. a closed cell foam 86. The sides of the post 81 adjacent the panel, in this case sides 84,85, are formed with a projecting tongue 87 located centrally of its respective side and extending longitudinally of the post. As can be seen in Fig.9 one tongue 87 is accommodated in a recessed side 28 of an I beam 14A or 14B of a panel. It will be appreciated that panels may be located against both tongues. Joining posts may be provided with tongues on one or more sides as is desired and opposite sides of the posts as well as adjacent sides.

Each tongue 87 is provide with a plurality of key-hole shaped apertures 96 which in use accommodate passage of the dowels 27 on the panels 11 (see Fig.7). On the inner surfaces of the post behind each aperture 96, there is located an assembly clip 97 which is aligned with the aperture 96. The clips 97 co-operate with the dowels 27 to secure wall panels and posts together. Each clip 97 is formed from spring steel and includes a second key hole shaped aperture 98 which engages a respective dowel 27. The lower portion of the clip sits against the inside surface of the post and the upper portion of the clip is inclined away from the inner surface and is provided with abutments 99 to space the end of the lower portion away from the inner surface.

In an alternative arrangement shown in Fig.14, in a straight wall or partition, the jointing post 81A between two panels 10A & 10B has a rectangular section with no tongue 87 and is accommodated within the recessed sides 28 of the I beams 14 between the top and bottom flanges 21, 22 thereof.

A dowel 27 is shown in Fig, 12 and has a plate 92 for mounting on the inner side of the web 23 of an I beam 14. The dowel 27 has a groove 94 providing a shoulder which co-operates with the key hole aperture 98.

In use a post 81 or 81A may be provided with an alignment lug or mark adjacent the top of the post which locates against the top rail 12 of a panel 10 to align the lower portions of the apertures 98 in the post with each dowel 27 to allow the post 81 to be inserted into a recess 28 of the I beam 15 forming the side of the panel 10. A second or other panel can be assembled in like manner to the other tongue 87 on the post.

In an alternative arrangement shown in Fig. 15, the upper portion of the post 81A is provided with a cap 101. The cap 101 is a close fit to the post and is stapled, or otherwise secured to the top surface of the post. The cap 101 holds the post 81A with the larger portions of the respective keyhole apertures 98 in alignment with the dowels on one panel until the post is driven into its operative position.

A second panel is then located over the post.

The post is then driven downwards, removing the cap 101 or other alignment lug, and engaging the shoulders 94 of respective dowels with the narrow part of each respective keyhole 98 in respective clips 97. Since the upper portions of the clips 97 are inclined to the

inside of the post this will pull the adjacent panels 10 towards each other and the resilience in the clip locks the panels and post together.

With reference to Fig. 13, wall panels 10 are mounted to a floor or base by the use of a sole plate 101. The sole plate 101 has a height or thickness slightly in excess of the depth of the recess 43 in the bottom rail 13. The recess 43 within the bottom rail 13 of each panel can slidably locate over the sole plate 101 which has previously been secured to the floor. Nails or other fixings are used to fix the panel 10 to the sole plate.

If desired, wall panels 10 may be placed on top previously assembled walls. A strip 102 (See Fig. 16) similar to the sole plate 101 is utilised and has apertures therein that align with the apertures 44 in top and bottom rails 12 & 13. In this manner, assembled walls may be provided with service conduits within the walls that extend from the top of a house to the bottom.

In another arrangement shown in Fig. 16 the top rail 12 is a "H" section rail having recesses 43 facing both inwardly (similar to Fig.7) and outwardly. The strip 102 is located in the recess 43 and protrudes out of the recess 43 to provide a location for the upper panel.

By using wall modules of different widths the vertical joints between adjacent wall panels in one layer of panels may be offset relative to the vertical joints in another layer.

The posts 81 may be provided with inter engaging elements at their top and bottom ends so that the posts can interlock vertically with each other.